

## CLAIMS

What is claimed is:

1. An improved injection molding apparatus having a mold with a cavity plate including a mold cavity with a gate and a vestige adjacent the gate, an injection nozzle for communicating a flowable material to the mold cavity, the nozzle having a moveable valve stem to selectively start and stop the communication of the flowable material through the nozzle and the gate, the improved apparatus comprising:

a replaceable insert installed in the cavity plate adjacent the vestige, the replaceable insert containing the gate having a passageway and a sealing portion that receive an end portion of the valve stem to stop the communication of the flowable material through the gate, the sealing portion being adjacent the vestige and having a diameter smaller than that of the vestige immediately adjacent the sealing portion.

2. The apparatus of claim 1, wherein the passageway has a substantial clearance with the valve stem to allow backflow of the flowable material along the valve stem as the end portion of the valve stem is received in the passageway.

3. The apparatus of claim 1, wherein the passageway has a close fit with the valve stem and wherein the valve stem has a feature which permits backflow of the flowable material along the valve stem as the end portion of the valve stem is received in the passageway.

4. The apparatus of claim 3, wherein the feature is at least one elongated slot on an outside surface of the valve stem.

5. The apparatus of claim 3, wherein the sealing portion has a smaller diameter than that of the passageway.

6. An improved injection molding apparatus having a mold with a cavity plate including a mold cavity with a gate and a vestige adjacent the gate, an injection nozzle for communicating a flowable material to the mold cavity, the nozzle having a moveable valve stem to selectively start and stop the communication of said flowable material through the nozzle and the gate, the improved apparatus comprising:

a replaceable insert installed in the cavity plate adjacent the vestige, the replaceable insert containing the gate having a passageway and a sealing portion that receive an end portion of the valve stem to stop the communication of flowable material through the gate, the passageway having a close fit with the valve stem, the valve stem having a feature which permits backflow of flowable material along the valve stem as the end portion of the valve stem is received in the passageway, the sealing portion being adjacent the vestige and having a diameter smaller than that of the vestige, the sealing portion having a diameter smaller than that of the passageway.

7. A gate insert in a cavity plate of a mold for injection molding, comprising:  
a body installed in the cavity plate adjacent a

vestige of a cavity in the cavity plate, the body having a passageway and a sealing portion for receiving an end portion of a valve stem of an injection molding nozzle to stop flow of material through the gate insert during an injection molding process, the sealing portion being adjacent the vestige and having a diameter smaller than the diameter of the vestige immediately adjacent the sealing portion.

8. An improved injection molding apparatus having a mold with a mold cavity defined therein, an injection nozzle for communicating a molten material to said mold cavity, the nozzle having a moveable valve stem to selectively start and stop the communication of said molten material through the nozzle, the improved apparatus comprising:

a replaceable insert installed in the mold adjacent the mold cavity, the replaceable insert having a bore that connects a melt channel of the injection nozzle with the mold cavity, the bore having a sealing portion adjacent the mold cavity for receiving an end portion of the valve stem to stop the communication of molten material to the mold cavity.

9. The apparatus of claim 8, further comprising a gate insert that partially defines a portion of the mold cavity, the replaceable insert being located in the gate insert.

10. The apparatus of claim 9, wherein the mold cavity includes a vestige forming portion that is located in the gate insert adjacent the replaceable insert.

11. The apparatus of claim 10, wherein the sealing portion of the bore has a diameter smaller than that of the vestige forming portion.

12. The apparatus of claim 8, wherein the bore has first portion and a second portion, the second portion being the sealing portion.

13. The apparatus of claim 12, wherein the first portion has a substantial clearance with the valve stem to allow backflow of molten material along the valve stem as the end portion of the valve stem is received in the bore.

14. The apparatus of claim 12, wherein the first portion is an alignment portion having a close fit with the valve stem.

15. The apparatus of claim 14, wherein the end portion of the valve stem aligns with the sealing portion so that the end portion is centered in the sealing portion by the fit between the alignment portion and the valve stem.

16. The apparatus of claim 14, wherein the sealing portion has a smaller diameter than the alignment portion.

17. The apparatus of claim 8, wherein the valve stem has a backflow feature which permits backflow of the molten material along the valve stem as the end portion of the valve stem is received in the bore.

18. The apparatus of claim 17, wherein the backflow feature is at least one elongated slot on an outside surface of the valve stem.

19. The apparatus of claim 17, wherein the backflow feature is a reduced diameter portion of the valve stem adjacent the end portion.

20. The apparatus of claim 8, wherein the replaceable insert is made of a material having a low thermal conductivity.

21. The apparatus of claim 20, wherein the material is titanium.

22. The apparatus of claim 20, wherein the material is ceramic.

23. The apparatus of claim 8, further comprising a cavity insert that partially defines a portion of the mold cavity, the replaceable insert being located in the cavity insert.

24. An improved injection molding apparatus having a mold with a mold cavity defined therein, and a gate insert defining a portion of the mold cavity including a vestige forming portion, an injection nozzle for communicating a molten material to said mold cavity, the nozzle having a moveable valve stem to selectively start and stop the communication of the molten material through the nozzle and the gate insert, the improved apparatus comprising:

a replaceable insert installed in the gate insert adjacent the vestige forming portion, the replaceable insert having a bore that receives an end portion of the valve stem to stop the communication of molten material through the gate insert, the bore having a sealing portion adjacent the vestige forming portion and an alignment portion having a close fit with the valve stem to center the end portion of the valve stem in the sealing portion, the sealing portion of the bore having a diameter smaller than that of the vestige forming portion and smaller than that of the alignment portion, the valve stem having a feature which permits backflow of molten material along the valve stem as the end portion of the valve stem is received in the bore.

25. A gate insert and a replaceable insert for an injection mold, the gate insert defining a portion of a mold cavity, the replaceable insert located in the gate insert adjacent the mold cavity, the replaceable insert comprising:

a body having a bore with a sealing portion for receiving a valve stem to stop flow of molten material through the bore, the replaceable insert being removable from the gate insert.

26. The gate insert and a replaceable insert of claim 25, wherein the portion of the mold cavity defined by the gate insert has a vestige forming portion adjacent the sealing portion of the replaceable insert, the vestige forming portion having a diameter, the sealing portion having a diameter smaller than that of the vestige forming portion.